among various fungi. Some 68 species of fungi, the majority of them belonging to the Uredinales, have been reported to show such specialization. The first known and best studied species is *Puccinia graminis*, producing the destructive stem rust of wheat and of other cereals and grasses. A few species having a wide range of hosts, like *P. subnitens*, appear not to be specialized. The citation of literature includes 174 titles, supplied by 67 writers, indicating the prominence which this line of investigation has attained within the last few years. ERIKSSON'S studies on the specialization of the grain rusts, reported in 1894, introduced the subject, but the fixed and unchanging character of physiological strains has first been shown definitely in the present paper, since being confirmed by STAKMAN and others.[20]

It is pointed out that so far the data do not indicate that bridging species are capable of altering the physiological nature of the parasite so as to enable it to extend the range of its natural hosts, as has heretofore been assumed. In fact, it appears that among fungous parasites there are definite strains or races not distinguishable morphologically, but only by their physiological behavior in infecting certain hosts, and that these strains retain the same characters through all the metamorphoses of the fungus, and when tested by use of any kind of reproductive body that the particular species produces. The specialization of the same fungus in widely separated regions may possibly be different, but the data are scanty. The relation of physiological specialization to morphological variation is barely mentioned. The whole subject of specialization is one of great scientific and economic interest, making the present admirable summary particularly timely.—J. C. ARTHUR.

Heath and grassland.—Continuing the investigations already noted[21] of certain English heaths and grassland, FARROW[22] has accumulated more data upon the effects of a rabbit population upon vegetation retrogression. It is demonstrated that the presence of rabbits alone is sufficient at times to change a pine forest through *Calluna* heath and *Carex arenaria* associations to a dwarf grass or a *Cladonia* heath. Experiments with irrigation and with the application of manure tend to show that both sterile soil and lack of soil moisture are factors in limiting the rate of growth and the luxuriance of the vegetation. This increased growth with improved conditions results in a decrease in the number of species in the area, since the more rapid growth of certain plants, like *Agrostis vulgaris*, smothered less vigorous ones, such as *Festuca ovina*.

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[20] STAKMAN, E. C., PARKER, J. H., and PIEMEISEL, F. J., Can biologic forms of stem rust on wheat change rapidly enough to interfere with breeding for rust resistance? Jour. Agric. Res. **14**:111–123. *pls. 13–17.* 1918.

[21] BOT. GAZ. **64**:263. 1917.

[22] FARROW, E. P., On the ecology of the vegetation of Breckland. III. General effects of rabbits on the vegetation. IV. Experiments mainly relating to the available water supply. V. Observations relating to competition between plants. Jour. Ecology **5**:1–18, 104–112, 155–172. 1917.

Evidence is also presented that such plants as *Pteris aquilina* and *Pinus* often succeed in competition owing to their dead foliage excluding the light from their competitors, causing etiolation and decay.

In a more recent paper FARROW[23] has examined the retrogression begun by rabbits and continued by sand blasts. This retrogression shows exactly the reverse order of the succession inaugurated by irrigation, being particularly noticeable in the *Agrostis vulgaris* giving place to *Festuca ovina* wherever the sand blast became intensive. Once begun, bare areas tend to increase, the sand assisting in destroying the vegetation both by direct attack and by removing the substratum, leaving clumps of grass upon the tops of small hummocks which are being constantly undermined. With the checking of wind erosion in such bare areas *Polytrichum* and *Cladonia* become agents of stabilization and revegetation.—GEO. D. FULLER.

Photosynthesis.—OSTERHOUT and HAAS[24] summarize as follows a piece of work on the dynamics of photosynthesis. "*Ulva* which has been kept in the dark begins photosynthesis as soon as it is exposed to sunlight. The rate of photosynthesis steadily increases until a constant speed is attained. This may be explained by assuming that sunlight decomposes a substance whose products catalyze photosynthesis or enter directly into the reaction. Quantitative theories are developed to account for the facts." The rate of photosynthesis was determined by the rate at which a portion of *Ulva* rendered sea water basic to phenolphthalein. Since the dissociation of carbonic acid is very slight, change of reaction is a very crude way of measuring the amount present. There is also the possibility of other exchanges of more strongly dissociating materials that could modify the reaction of the water. In the face of excellent and very accurate methods for the quantitative determination of carbon dioxide it seems hardly justifiable to use this questionable method for a study of either respiration or photosynthesis. It is also doubtful whether sufficient regard has been given to other possible limiting factors of the rate of photosynthesis in these experiments. If, in spite of the defects of experimentation, the general conclusion proves true, it is a contribution of great significance and aids in confirming WILLSTÄTTER'S view that the presence of a catalyzer is a common internal limiting factor to the rate of photosynthesis.—WM. CROCKER.

Organic plant poisons.—BRENCHLEY[25] finds hydrocyanic acid very toxic to pea and barley seedlings in water cultures. Hydrocyanic acid in concentrations of 1 part to 100,000 proved rather quickly fatal for peas and somewhat

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[23] FARROW, E. P., On the ecology of the vegetation of Breckland. V. Characteristic bare areas and sand hummocks. Jour. Ecology **6**:144–152. 1918.

[24] OSTERHOUT, W. J. V., and HAAS, A. R. C., Dynamical aspects of photosynthesis. Proc. Nat. Acad. Sci. **4**:85–91. 1918.

[25] BRENCHLEY, WINIFRED E., Organic plant poisons. I. Hydrocyanic acid. Ann. Botany **31**:447–456. 1917.